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GB 2334242 A GB 2319751 A GB 2314300 A
GB 1450666 A

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(54) Abstract Title
Air bag with secondary porous gas flow duct

(57) An air bag 1 adapted to be inflated with gas from a gas generator 16 defines a gas supply duct 13 to channel gas from the generator to one or more chambers 7-12 also defined by the structure of the air bag. Located within the gas supply duct is a secondary porous gas flow duct 17 having one end adapted to receive gas from the generator and intended to supply gas to the chambers and at the same time reduce the damage incurred by the supply duct 13 due to the rapidly travelling gas. At the apertures to the chambers 7-12 the ability of the gas to pass from the secondary gas flow duct 17 into the gas supply duct 13 and thus into the chambers may be enhanced by a variety of embodiments including, increasing the porosity of the secondary gas flow duct 17 (figure 3), increasing the diameter of the gas supply duct 13 (figure 4), decreasing the diameter of the secondary gas flow duct 17 (figure 5), or increasing the diameters of both ducts (figure 6).

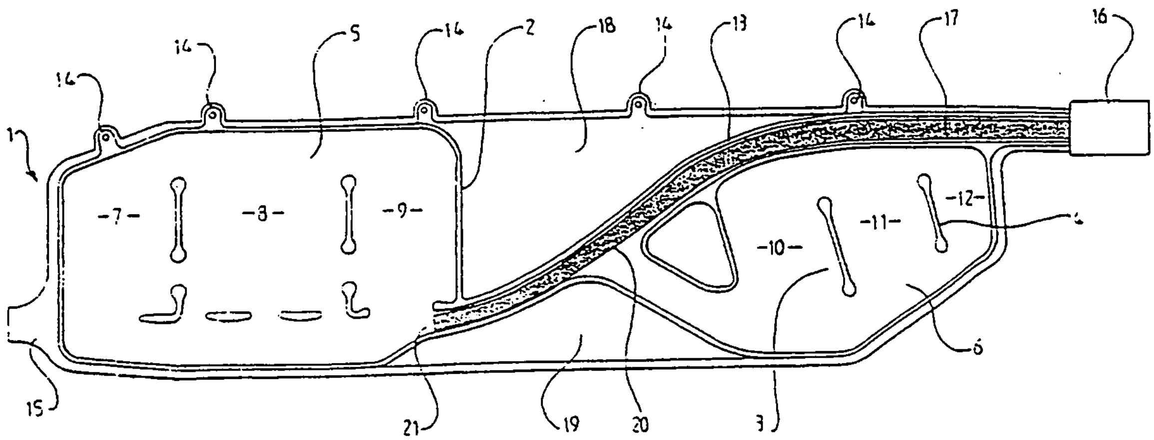

FIG 1

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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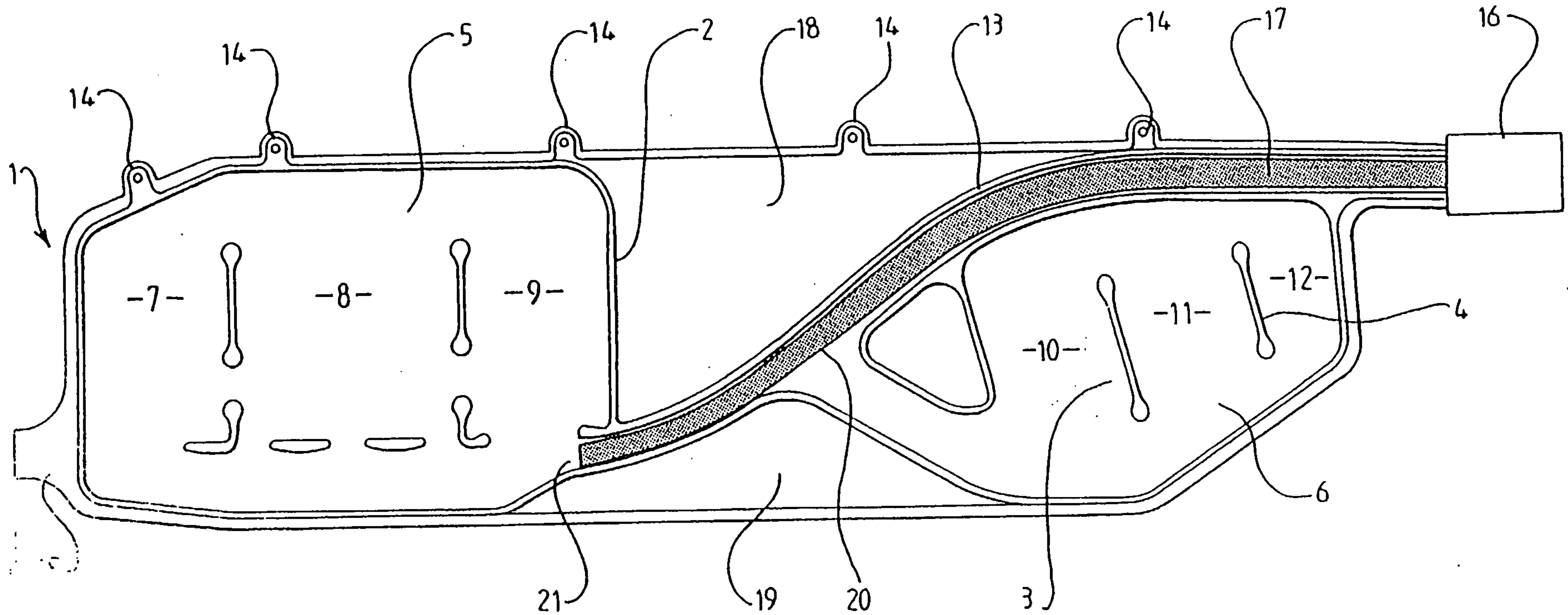

FIG 1

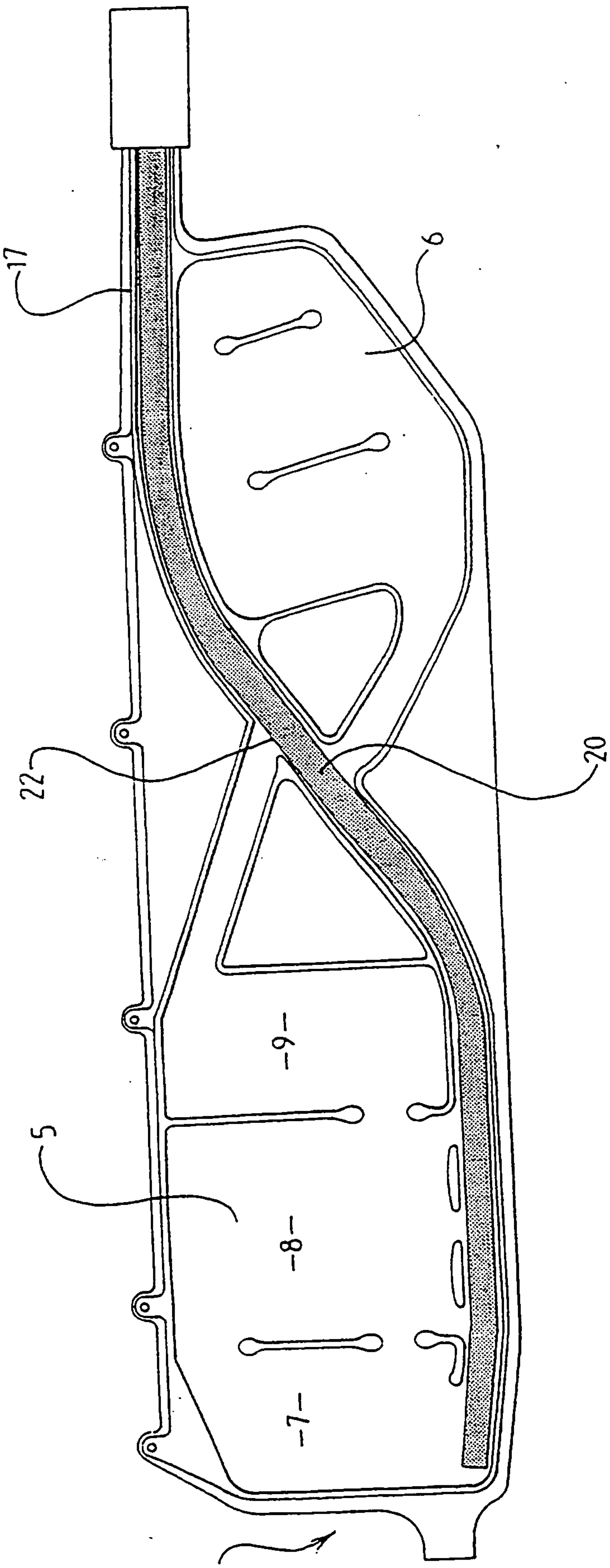

FIG 2

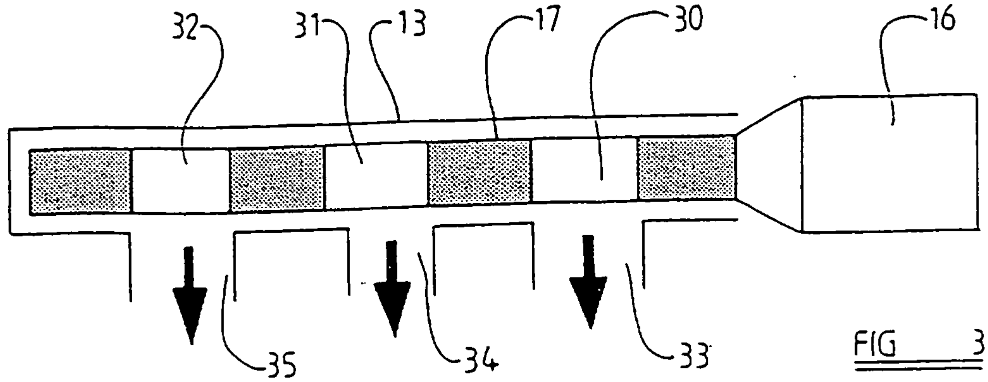

FIG 3

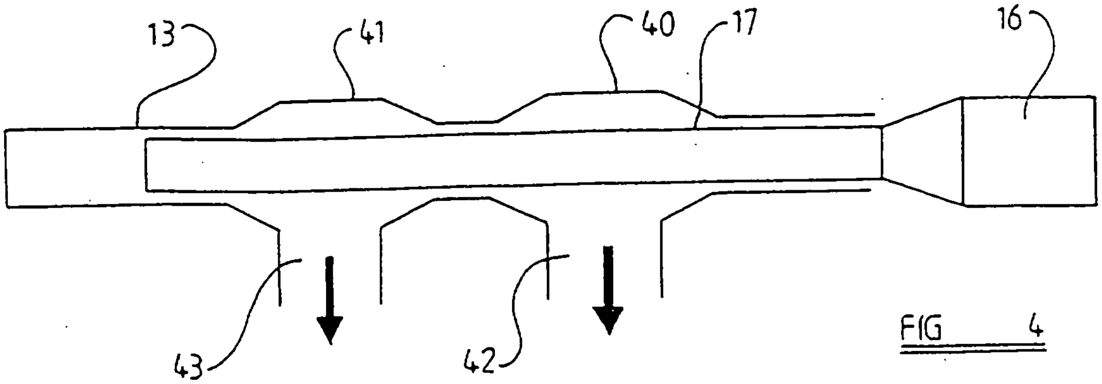

FIG 4

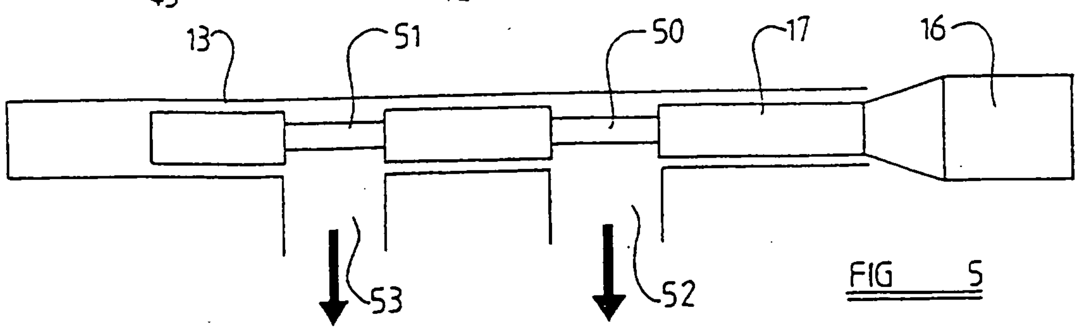

FIG 5

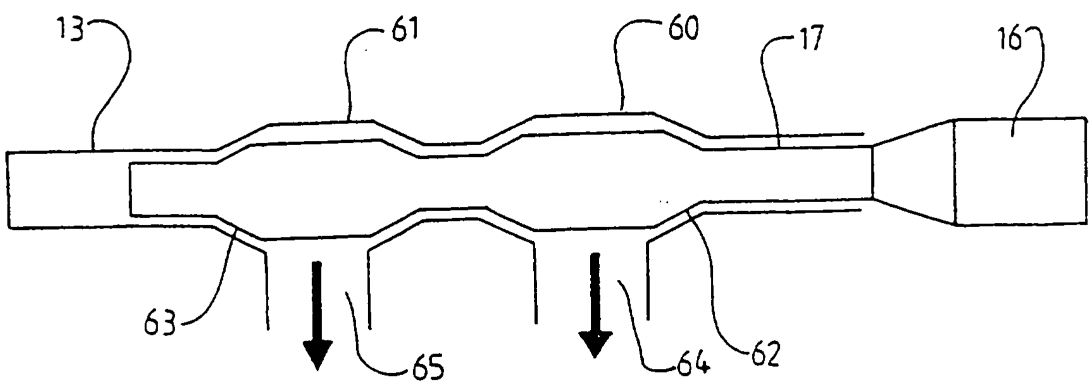

FIG 6

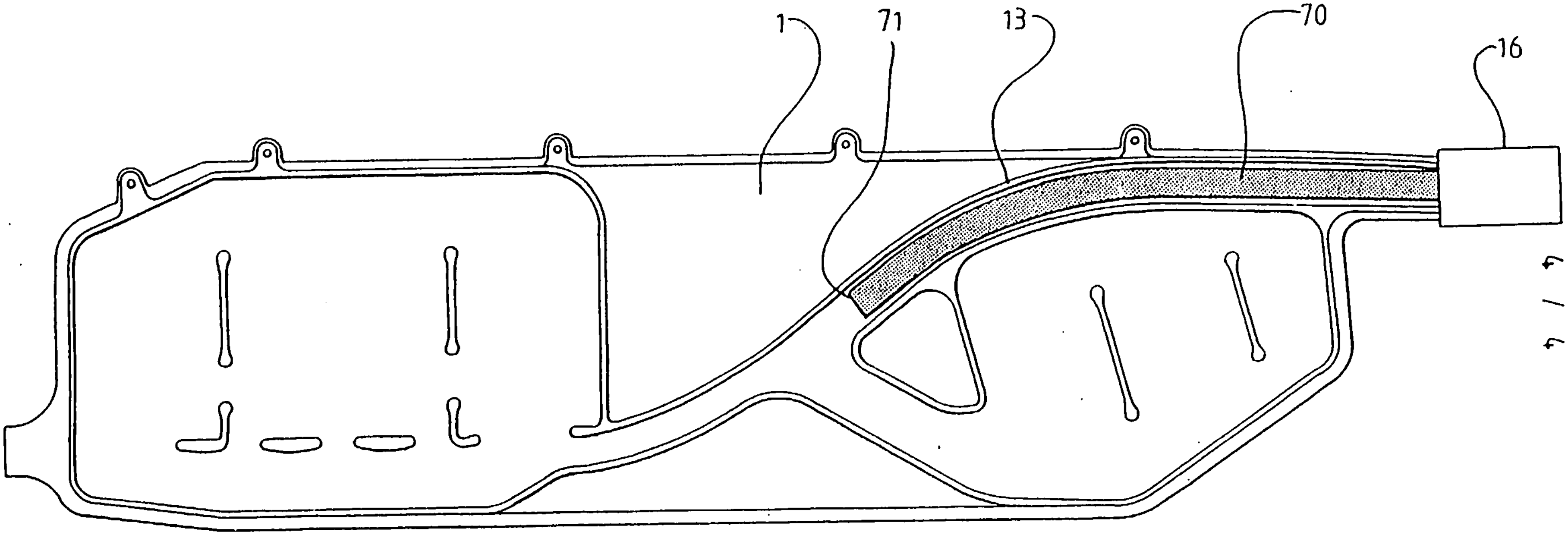

FIG 7

DESCRIPTION OF INVENTION

"IMPROVEMENTS IN OR RELATING TO AN AIR-BAG ARRANGEMENT"

THE PRESENT INVENTION relates to an air-bag arrangement, and more particularly relates to an air-bag arrangement for use in a motor vehicle.

It has been proposed to provide an air-bag, adapted to be inflated in the event that an accident should arise, the air-bag being intended to be located at a position between an occupant of the vehicle and an adjacent door or side window. An air-bag of this type is disclosed in GB-A-2,314,300 and the air-bag comprises two panels which are interconnected to define a plurality of substantially vertical cylindrical cells. A gas flow passage is provided, provided with a tubular inner wall, there being breaks in the inner wall to feed gas preferentially into the selected cells.

The present invention seeks to provide an improved air-bag arrangement.

According to this invention there is provided an air-bag adapted to be inflated with gas from a gas generator, the air-bag defining a gas supply duct to lead from the gas generator to one or more chambers or cells adapted to be inflated by gas from the gas generator, there being a secondary porous gas flow

duct located within the gas supply duct defined by the air-bag, the secondary porous gas flow duct having two opposed ends, one end of the secondary gas flow duct being adapted to receive the gas from the gas generator.

Preferably the secondary gas flow duct is of uniform porosity along its length.

Alternatively the secondary gas flow duct is not of uniform porosity along its length, and has one or more regions of enhanced porosity, the or each region of enhanced porosity being located adjacent an opening leading to a cell or chamber of the air-bag which is to be inflated.

Conveniently the diameter of the secondary porous gas flow duct is smaller than the diameter of the gas supply duct defined by the air-bag in at least one region adjacent an opening leading to a cell or chamber of the air-bag which is to be inflated.

Preferably the secondary gas flow duct extends past at least one opening leading to a cell or chamber of the air-bag which is to be inflated, the secondary gas flow duct defining gas flow paths from the interior of the duct to the exterior of the duct, the cross-sectional area of the gas flow paths being greater in a region adjacent the opening than in a region remote from the opening.

In one embodiment the diameter of the secondary porous gas flow duct is substantially uniform along its length, and the diameter of the gas supply duct defined by the air-bag increases in regions adjacent said openings.

In an alternative embodiment the diameter of the gas supply duct defined by the air-bag is substantially constant, and the diameter of the inner secondary porous gas flow duct is reduced in regions adjacent said openings.

In a further embodiment the diameter of the gas supply duct defined by the air-bag is increased in the regions adjacent the openings, and the diameter of the secondary porous gas flow duct is increased in the regions of the openings.

In yet another embodiment the secondary gas flow duct is of tapering form.

In certain embodiments the other end of the secondary gas flow duct is closed.

In order that the invention may be more readily understood, and so that further features thereof may be appreciated, the invention will now be described, by way of example, with reference to the accompanying drawings in which:

FIGURE 1 is a diagrammatic view illustrating one embodiment of the invention,

FIGURE 2 is a diagrammatic view illustrating a second embodiment of the invention,

FIGURE 3 is a diagrammatic view illustrating an inner gas supply duct and openings leading to associated cells,

FIGURE 4 is a view corresponding to Figure 3 showing a gas supply duct and openings leading to associated cells,

FIGURE 5 is a view corresponding to Figure 3 showing a gas supply duct and openings leading to associated cells, and

FIGURE 6 is a view corresponding to Figure 3, again showing a gas supply duct and openings leading to associated cells.

FIGURE 7 is a view corresponding to Figure 1 illustrating a modified embodiment of the invention.

Referring initially to Figure 1 of the accompanying drawings, an air-bag comprises an inflatable element 1 formed of two adjacent layers of fabric inter-connected by seams, such as the seams 2, 3, 4. The air-bag of Figure 1 is divided into two separate inflatable chambers 5, 6, with the chamber 5 being sub-divided into individual cells 7, 8, 9 and the chamber 6 being sub-divided into individual cells 10, 11, 12.

The air-bag defines a gas supply duct 13 which communicates with the chambers 5 and 6.

The air-bag 1 is provided with a plurality of fixing lugs 14 for use in fixing the air-bag in position and is provided with a lug 15 adapted to be connected to a fixing strap.

The air-bag 1 is adapted to be mounted in a motor vehicle with the lugs 14 connected to part of the motor vehicle extending above the door opening, and a strap attached to the lug 15 extending to a point provided, for example,

on the A-Post of the vehicle. The air-bag is intended for use in conjunction with a gas generator 16 adapted to direct a flow of gas through the gas supply duct 13. Thus, in an accident situation, gas will be supplied to the chambers 5 and 6 inflating the inflatable element. The regions 18 and 19, located between the chambers 5 and 6, will remain uninflated.

In the illustrated embodiment of the invention, a secondary porous fabric gas flow duct 17 is provided which is connected to the gas generator 16 and which extends within the gas supply duct 13 defined by the air-bag 1. The secondary porous gas flow duct 17 directs the flow of gas within the gas supply duct 13. The gas from the gas generator 16 may move very swiftly, and a swift flow of gas may damage the inflatable element. However, the fabric of the porous secondary gas flow duct is located between the stream of gas and the fabric forming the air-bag 1, and thus the risk of damage being effected to the air-bag 1 is reduced.

It is to be appreciated that, in the embodiment of Figure 1, gas will emerge from the porous gas flow duct 17 in the region 20 adjacent the open mouth of the chamber 6. Gas will also leave the open end 21 of the secondary porous gas flow duct 17 which is in communication with the chamber 5.

In a modified embodiment of the invention, as shown in Figure 2, the air-bag 1 is of a slightly modified design, and the porous secondary gas supply duct extends into the chamber 5. In this embodiment, in addition to the porous secondary gas flow duct 17 having a region 20 adjacent an open mouth leading to the chamber 6, the porous secondary gas flow duct 17 has a region 22 adjacent an open mouth leading to the cell 9 of the chamber 5. The secondary porous gas flow duct 17 also extends into the chamber 5, thus minimising the

risk of damage to the seams defining the peripheries of the cells 7 and 8 within the chamber 5.

Referring now to Figure 3, which is a very diagrammatic figure, it is to be appreciated that the porous secondary gas flow duct 17 which is contained within the primary gas supply duct 13 as defined by the air-bag 1, may be such that the regions 30, 31, 32 of the secondary gas flow duct 17 adjacent opening 33, 34, 35 which lead to cells or chambers to be inflated, are made to be more porous than the intermediate regions of the secondary gas flow duct 17. Thus gas can readily emerge through the porous regions 30, 31, 32 and be directed preferentially towards the openings 33, 34, 35 that lead to chambers or cells of the inflatable element that are to be inflated.

It is thus to be appreciated that the secondary flow duct, which extends past at least one opening leading to a cell or chamber of the air-bag which is to be inflated, may define gas flow paths leading from the interior of the duct to the exterior of the duct. The gas flow paths may be the pores of a porous region, or may be openings or holes provided in the duct. The cross-sectional area of the gas flow paths is relatively high in a region adjacent an opening leading to a cell or chamber that is to be inflated. However, in regions remote from the openings the cross-sectional air of the gas flow paths will be much lower and, indeed, there may be no gas flow paths at all in such regions remote from the openings.

In an alternate or modified embodiment of the invention, as shown schematically in Figure 4, the secondary gas flow duct 17 may be of uniform configuration and uniform porosity, but the gas supply duct 13 as defined by the air-bag may have regions 40, 41 of a large diameter adjacent openings 42, 43 that lead to cells or chambers that are to be inflated. It is to be appreciated

that in such an embodiment the porous secondary gas flow duct 17 will substantially abut the gas supply duct 13 defined by the air-bag 1 in regions which are spaced from the openings 42, and thus it will be difficult for gas to pass out of the inner secondary gas flow duct in those regions. However, in regions adjacent the openings 42, 43, because of the enlarged diameter of the gas supply duct 13 formed in the inflatable element, gas will be able to leave the secondary gas flow duct 17 and flow through the openings 42, 43, to inflate the relevant chambers or cells.

In a further modified embodiment, as shown in Figure 5, the gas flow duct 13 defined by the inflatable element is of uniform cross-section, but the secondary porous gas flow duct 17 has a region 50, 51 of reduced diameter adjacent openings 52, 53 which lead to cells or chambers to be inflated. Again in the regions of the secondary gas flow duct 17 remote from the openings 52, 53, the secondary gas flow duct 17 will be dimensioned, relative to the size of the gas flow duct 13 defined by the air-bag 1, so that virtually no gas can escape from the secondary gas flow duct 17. However, in the regions 50, 51 adjacent the openings 52, 53, gas will be able to escape from the inner porous supply duct to inflate the relevant chambers or cells.

Figure 6 illustrates a further modified embodiment of the invention in which the gas supply duct 13 defined by the inflatable element has a large diameter region 60, 61, and also the inner porous secondary gas flow duct 17 has enlarged diameter regions 62, 63 adjacent openings 64, 65 which lead to cells or chambers within the air-bag that are to be inflated. In the embodiment of Figure 6, again it is to be noted that the dimension of the regions of the inner secondary porous gas flow duct 17 remote from the openings 64, 65 relative to the size of the gas flow duct 13 as formed in the air-bag 1, are such that virtually no gas will escape from the inner porous gas flow duct in these

regions. In the regions adjacent the opening 64, 65, because of the enlarged diameter portions 62, 63 of the inner porous secondary gas flow duct 17, there will be a maximum area available through which gas may escape. The enlarged diameter portion 60, 61 of the gas supply duct 13 defined by the air-bag 1 accommodate the enlarged regions of the inner porous secondary gas flow duct 17.

Figure 7 illustrates an air-bag which is identical with the air-bag of Figure 1, provided with a porous gas flow duct 70. The porous gas flow 70 extends from the gas generator 16 through the gas supply duct 13 defined by the air-bag 1. The gas flow duct 70, as shown in Figure 7 is much shorter than the gas flow duct 17 shown in Figure 1 and terminates with an end 71 which, in this embodiment, is closed. The gas flow duct 70 is of tapering form. Thus, in the embodiment illustrated, the gas flow duct 70 extends from the gas generator 16 through a portion of the gas supply duct 13 which is of uniform diameter, and terminates before passing any opening leading to a cell or chamber.

Gas from the gas generator will, when the air-bag is deployed, be injected into the gas flow duct 70. Gas will flow through the pores of the gas flow duct 70 into the gas supply duct 13 defined by the air-bag 1. However, part of the energy of the gas will have been dissipated by the time that the gas reaches the gas supply duct 13, and thus the risk of the gas damaging the air-bag 1 is reduced.

Whilst the invention has been described with reference to specific embodiments in which the air-bag is adapted to be located between an occupant of a motor vehicle and an adjacent door or window, it is to be appreciated that the invention may be utilised in other air-bags.

In the present specification "comprise" means "includes or consists of" and "comprising" means "including or consisting of".

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS:

1. An air-bag adapted to be inflated with gas from a gas generator, the air-bag defining a gas supply duct to lead from the gas generator to one or more chambers or cells adapted to be inflated by gas from the gas generator, there being a secondary porous gas flow duct located within the gas supply duct defined by the air-bag, the secondary porous gas flow duct having two opposed ends, one end of the secondary gas flow duct being adapted to receive the gas from the gas generator.

2. An air-bag according to Claim 1 wherein the secondary gas flow duct is of uniform porosity along its length.

3. An air-bag according to Claim 1 wherein the secondary gas flow duct is not of uniform porosity along its length, and has one or more regions of enhanced porosity, the or each region of enhanced porosity being located adjacent an opening leading to a cell or chamber of the air-bag which is to be inflated.

4. An air-bag according to Claim 1 wherein the secondary gas flow duct extends past at least one opening leading to a cell or chamber of the air-bag which is to be inflated, the secondary gas flow duct defining gas flow paths from the interior of the duct to the exterior of the duct, the cross-sectional area of the gas flow paths being greater in a region adjacent the opening than in a region remote from the opening.

5. An air-bag according to any one of the preceding Claims wherein the diameter of the secondary porous gas flow duct is smaller than the diameter of the gas supply duct defined by the air-bag in at least one region adjacent an opening leading to a cell or chamber of the air-bag which is to be inflated.

6. An air-bag according to Claim 5 wherein the diameter of the secondary porous gas flow duct is substantially uniform along its length, and the diameter of the gas supply duct defined by the air-bag increases in regions adjacent said openings.

7. An air-bag according to Claim 5 wherein the diameter of the gas duct defined by the air-bag is substantially constant, and the diameter of the inner secondary porous gas flow duct is reduced in regions adjacent said openings.

8. An air-bag according to Claim 5 wherein the diameter of the gas supply duct defined by the air-bag is increased in the regions adjacent the openings, and the diameter of the secondary porous gas flow duct is increased in the regions of the openings.

9. An air-bag according to Claim 1 or 2 wherein the secondary gas flow duct is of tapering form.

10. An air-bag according to any one of the preceding Claims wherein the other end of the secondary gas flow duct is closed.

11. An air-bag substantially as herein described with reference to and as shown in Figure 1 of the accompanying drawings.

12. An air-bag substantially as herein described with reference to and as shown in Figure 2 of the accompanying drawings.

13. An air-bag substantially as herein described with reference to and as shown in Figure 3 of the accompanying drawings.

14. An air-bag substantially as herein described with reference to and as shown in Figure 4 of the accompanying drawings.

15. An air-bag substantially as herein described with reference to and as shown in Figure 5 of the accompanying drawings.

16. An air-bag substantially as herein described with reference to and as shown in Figure 6 of the accompanying drawings.

17. An air-bag substantially as herein described with reference to and as shown in Figure 7 of the accompanying drawings.

18. Any novel feature or combination of features disclosed herein.

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Application No:	GB 9930440.4	**Examiner:**	Peter Gardiner
Claims searched:	1 - 10	**Date of search:**	5 April 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): B7B: BSBCC, BSBCR

Int Cl (Ed.7): B60R: 21/16, 21/20, 21/26

Other: Online: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB 2334242 A	DELPHI AUTOMOTIVE (see abstract and conduit 16 in figure 1)	
A	GB 2319751 A	AUTOLIV DEVELOPMENT (see abstract and gas duct 17 in figures 2 and 5)	
A	GB 2314300 A	AUTOLIV DEVELOPMENT (see abstract and flow passage 7 in figure 2)	
A	GB 1450666 A	CHRYSLER CORP (see page 2 lines 40 to 49 and conduit 37 in figures 8 to 10)	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.